TECHNICAL EVALUATION CRITERIA
STREAMS II
TASK ORDER SOLICITATION PR-ORD-12-00843

TITLE: Ground Water Conceptual Site Model for San Mateo Creek Basin Legacy Uranium Site, Grants Mining District, New Mexico

EVALUATION CRITERIA: Contractors shall limit their responses to ten (10) pages or less. Proposals will be evaluated by the project Technical Review Panel, led by the Contracting Officers representative (TOM) and will be assigned a score from 0-100 based on the criteria listed below. The task order will be awarded on the basis of a Best Value decision, where Technical Quality will be considered more important than Cost.

CONTRACTOR: _____

CRITERION 1 Technical Approach

Offerors shall demonstrate knowledge and understanding of the following:

- Ground water conceptual site model development related to hydrogeological structure, geochemistry and ground water-flow systems for evaluating spatial, temporal and vertical extent of water quality impacts caused by uranium mining related contamination on a basin-wide scale.
- Three dimensional predictive ground water flow and transport models (such as MODFLOW) for assessing the environmental impacts of mine water discharges on the shallow alluvial ground water within the San Mateo Creek drainage basin and underlying bedrock ground water along the southern margin of the San Juan Structural Basin. Knowledge and understanding of models that deal with density-driven flow caused by high total dissolved solids (TDS) or unsaturated flow (e.g. HYDRUS) to simulate the saturation and dewatering of the vadose zone will also be important.
- Protocols for ensuring high quality modeling results through proper model calibration, validation, and quality control of model output, as well as sensitivity and uncertainty analyses to estimate where and what type of data would be most beneficial to improve the model and to assess various conceptual model hypothesis.
- Geology, including geologic features that affect ground water flow, geologic maps and cross sections. Shall also demonstrate knowledge and understanding of how to prepare high quality contour maps and cross sections delineating shallow alluvium, bedrock formation structure, formation thickness and faulting.
- Hydrology, including aquifer characterization, general ground water chemistry, and contaminant fate and transport for radionuclides and metals. Shall also demonstrate knowledge and understanding of how to prepare potentiometric surface maps, contaminant isoconcentration contour maps for plume delineation, concentration versus time graphs and other various graphs and tables for displaying hydrological and hydrogeological data.
- Geochemistry, including (1) geochemical reactions and the fate and transport of contaminants such as metals, radionuclides (e.g., uranium) and trace elements typically associated with uranium (e.g., vanadium, molybdenum, selenium, and arsenic) in the aqueous phase, (2) piper diagrams, stiff diagrams, chemical cross plots and other graphs and diagrams to identify and evaluate geochemical endmembers and ground water sources, (3) radionuclide isotope and stable isotope geochemistry.
- Petrography, including petrographical and mineralogical analysis of rock cores or cuttings using scanning electron microscopy (SEM) or other appropriate methods to assess changes in mineral composition and grain coatings of alluvial sediments caused by the invasion of mine water discharges into previously unsaturated sediments and then a return to unsaturated conditions.

- Geophysics, including (1) reconnaissance ground based electromagnetic (EM) studies to identify electrical conductivity anomalies associated with mine water discharges that have saturated the alluvium and bedrock, (2) airborne EM survey over a corridor of the basin along drainages (creeks and arroyos) that received mine water discharges, (3) borehole EM and spectral-gamma-ray measurements to verify air borne survey, (4) refractive and reflective seismic surveys, and (5) other geophysical well logging methods and the correlation and interpretation of geophysical well logs.
- Borehole drilling and monitoring well construction.
- Ground water sampling.
- Demonstrate capability to acquire, manipulate, manage, or otherwise work with large data sets.
- Demonstrate capability to produce high quality technical reports and/or manuscripts written in clear, concise prose consistent with the standards of peer reviewed scientific literature.

Scale: 0 (lowest) to 50 (highest) Score: _____
Comments:

CRITERION 2 Personnel

The contractor shall provide information on the experience, strengths, and skills of the staff that will be assigned to the tasks in the Performance Work Statement including all training and experience relevant to the criteria listed above.

Scale: 0 (lowest) to 30 (highest) Score: _____
Comments:

CRITERION 3 Corporate Experience

- Demonstrate corporate experience completing large, data intensive projects on time and within budget.
- Demonstrate corporate experience assembling teams of multidisciplinary individuals to execute technical, data-intensive project related to predictive transport modeling, geology, hydrology, geochemistry, petrography, geophysics, field investigation involving borehole drilling, monitoring well construction, and ground water sampling.
- Corporate experience within the last 3 years will be given priority.

Scale: 0 (lowest) to 20 (highest) Score: _____
Comments:

Signature of Evaluator:_____ Date_____ Total Score: _____

Earle's comments.

Title: Appears to describe a "conceptual site model or CSM." The CSM is a loaded term that has many broad definitions, or it can be a very heavy, technical behemoth that is a multi-component, integrated summary of qualitative and quantitative observations, measurements, interpretations, and such.

NEED TO CLARIFY EPA's TERM FOR THE CSM FOR THIS PROJECT. The design of the CSM for the SMC Basin has to consider the CERCLA Process & where the CSM fits into that process? It also has to accommodate some level of assessment toward the risk to Navajo human & environmental resources if the release of hazardous materials poses a threat in a land use scenario above EPA CERCLA risk standard 1 X 10E-6 to 10E-4. Actually, Navajo Nation cleanup risk is 3 X 10E-5 (I think). Anyway, EPA needs a complex CSM capability for the SMC Basin if it is to go forward with a HRS scoring and NPL consideration.

Numerical models exist for parts of the SMC Basin area and the San Juan Basin. Will this model include the Morrison Formation dewatering flow modelling? The size of the region and the number of units to be modeled – YIKES!

The type of CSM that appears by reading the Technical Approach is a "dynamic" CSM. This means that the CSM is initially crafted out of the existing data and state of knowledge in a mostly quantitative-semi quantitative fashion. The dynamic CSM is ongoing and updated to a point, then it stops. The historical and recent data are summarized in logs, maps, tables, figures, and plots of various types to demonstrate that the CSM has evolved. The CSM is represented by all the figures we have been creating and fine tuning including the geochemical relationships. The CSM has evolved to the level where it is now appropriate to "numericalize" the data in a comprehensive database that can be used to support: analytical models (equations like mass loading, concentration changes); numerical flow models (MODFLOW); geochemical (WATEQ, PHREEQ, MINTEQ). I don't know HYDRUS but it looks like a slick vadose zone software that can link to or do things like the saturated geochem models.

One may not need to go all the way with a vadose zone model if we can simulate re-saturation of dried Qal sediments with coatings and precipitants using PHREEQ to see if COCs can be returned to the dissolved or mobilized state by several different speciation complexes under oxygenated conditions, or simple adsorption. This approach is also supported by the SEM and laboratory leaching (SLSP) of core samples to help inform and bound the geochem transport modelling.

Careful on using the terms model "calibration and validation." Calibration means they match the model settings using historical values so it matches or is calibrated to existing data. Doesn't mean it is now ready to make any predictions. If you have 10-20 years of data, then one could predict 10 to 20 years of possible realizations depending on the sensitivity factors. Most flow models are hyper, super sensitive to hydraulic k measurements and values. Having a water level value in 2D space is great, but seldom do we have any or enough k values so they have to use reasonable estimates. The finer the model grid (finite element versus finite difference), the more the model is sensitive to the lack of real k values. Getting a flow model of the SMC Basin alluvial and/or bedrock aquifers????---that is going to require an awful lot of assumptions & estimates because the region is so large with so few quality data points. UGH! You might want to think about this issue. We had to deal with large regional flow models in Nevada at the Test Site and Yucca Mountain. They are so filled with uncertainties. You may want to think of more along a "particle flow path model." A model of just the flow path along the SMC Qal from the 509/605 Junction to Homestake might be all that is needed. A regional groundwater flow and transport model is a huge undertaking!

Models cannot be validated according to Konikow, one of the world's best modelers. In order to validate a model, the model has to use existing data to make a prediction of where a COC concentration would exist now or shortly in the future, and the validation would be to drill a well at that location, sample, analyze, & check to see if it matched the predicted location-value from the model. The grid of a model for the SMC Basin would be very coarse in some places, and dense (finer grid spacing) along the Qal channel. So many grid nodes with no real data point and almost no hydraulic k values.

CONTOURING. I think that before numerical modelling would get very far, the contouring of water levels and COC levels would be very revealing first along the flow path of interest. We need to define the primary flow path of interest for the SMC Basin.

Models can help summarize & organize multiple data components so that management can decide where or how to spend resources to reduce uncertainty. I'm back to the scope of the model for the SMC Basin – I think that is going to be so large & unreliable. One is going to have to think about a smaller scale model that focuses on satisfying the CERCLA Process RI/FS need. I don't think a regional flow model for the SMC Basin is appropriate? It would be nice. Nice and expensive.

QUALIFICATIONS. The list of subject matter expert areas under Technical Approach is very comprehensive. Here are the things that I have seen over my years that most contractors lacked:

1. Competent field hydrogeologist: knowledgeable in full scope inorganic and radiochemistry water sampling design, field chemistry parameter measurement, radiochemistry lab requirements, all parameter holding times, *laboratory methods and reporting of errors*, and good communicator with laboratories to track sample status from receiving, to analysis, & reporting of lab data in an electronic format ready made for quantitative analysis.
2. Competent radiochemistry knowledge of U238 radionuclide series. This includes soil and water. Also radon gas knowledge because Grants area is naturally high in Rn222.
3. Competent statistical knowledge especially for ProUCL software. ProUCL seems to be the norm on any sites these days. I guess everything that has been done at the EPA Region 6 Sites, UNC and HMC, are fair game for the SMC Basin contractor analytical tool capability-possibility?
4. Uranium mining and milling industry operations-history-technology.

GEOPHYSICS CAPABILITY. As we learned with the USGS and the latest work in the SMC Basin, geophysics is a neat tool but so far it has not really demonstrated its worth to this project? Maybe certain complicated sites could use the seismic and resistivity to show structure, bedding, and maybe places of saturation. But for the trouble, cost, & unreliability—I don't think it is going to be worth the while. I think good old fashioned, air rotary drilling is going to be the best bang for the buck. A track mounted rig that can do hollow stem auger and also air rotary is available so you don't have to have 2 rigs. I think drilling to 1,000 feet in some places along the Qal channel is going to provide a lot of useful information (hyd k values) that geophysics can't provide. It is unfortunate that we have to drill deep to figure things out in some locations, but groundwater is hard to find in the region & it is usually deep unless the alluvium or structure brings it closer to the surface. Drilling would usually leave a well in a location as a future resource tool, whereas, geophysics doesn't leave a tool in place for use.

FORM SCORING DESIGN. No offense Mark, but it is rather subjective at this point in design so it would depend highly on how the scorer reacts to the response provided by the interested contractor. The form appears biased toward "corporate experience." What if you substituted the word "CERCLA" for "corporate?" The scoring is based on possible sub-scores for each sub-area of expertise, but the criteria for scoring is not provided.

To me a lean, CERCLA experienced contractor with the right inorganic and radiochem experience in a mining district is what is needed. Some of the scope and potential size of work complexities describe tend to make this CSM project a very large undertaking. If it is going to be that large, make sure it gives Navajo something they can link over into their water resources program. You may want to think about how the model might support the regional water plan for the Grants, NM area—then you would get a better fit for what would only be useful to EPA and NMED?

Technical quality is emphasized over cost control? Is that what you are saying? Think smart. Good technical quality can be done for a reasonable cost IF the scope is well defined, the products are well defined, & the staff are capable and well supervised to get things done with focus and quality.